Impact of Spaced Retention Technique on Knowledge and Attitudes of Dental Students towards Oral Cancer Screening: An Educational Intervention Study

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Abstract:

Background:

Oral cancer is the sixth most common malignancy worldwide, with India contributing nearly one-third of the global burden. Oral squamous cell carcinoma (OSCC) constitutes up to 97% of all oral cancers. Potentially malignant disorders (PMDs) such as leukoplakia, erythroplakia, and oral submucous fibrosis precede OSCC, making their early recognition critical for effective intervention. Despite their pivotal role in prevention and diagnosis, dental professionals often lack sufficient knowledge and skills to identify oral cancer at an early stage. Employing innovative educational approaches, such as the spaced repetition technique, may enhance both learning and long-term knowledge retention.

Aim:

To enhance the capacity of junior dentists in practising oral cancer screening through an intervention based on the spaced repetition technique.

Materials and Methods: A longitudinal educational intervention was conducted among dental interns at Lenora Institute of Dental Sciences, Rajahmundry (December 2023). A validated pre-structured questionnaire assessed baseline knowledge of oral cancer screening. Interns attended an expert-verified PowerPoint session on oral cancer and precancerous lesion recognition.

Knowledge retention was evaluated using the spaced repetition model, with assessments on Day 1, Day 7, and Day 16. Data were analysed using SPSS v26.0, with pre- and post-test results compared via chi-square test ($p<0.05$).

Results:

There was a statistically significant improvement in knowledge scores from baseline to subsequent assessments ($p<0.05$). Students demonstrated increased accuracy in identifying precancerous lesions and expressed heightened confidence in screening practices. Attitudinal changes were observed, with most interns reporting greater willingness to incorporate oral cancer screening into clinical practice and seeking further training opportunities.

Conclusion:

The intervention effectively improved knowledge and reinforced long-term retention among dental students. Spaced repetition proved to be a useful method for sustaining learning, highlighting the importance of integrating oral cancer education and active learning strategies within dental curricula for improved early detection and prevention.

Keywords: Oral cancer, OSCC, Precancerous lesions, Spaced repetition, educational intervention, Dental students.

INTRODUCTION

Globally, oral cancer is the sixth most common type of cancer, with India contributing to almost one-third of the total burden, and the second country having the highest number of oral cancer cases. In India, around 77,000 new cases and 52,000 deaths are reported annually, which is approximately one-fourth of global incidences. Oral squamous cell carcinoma (OSCC) contributes remarkably, i.e., 84-97% to oral cancer[1].

Potentially malignant disorders (PMDs) such as inflammatory oral submucous fibrosis, erythroplakia, leukoplakia, dyskeratosis congenita, and lichen planus are indicators of the preclinical phase of oral cancer.[1]

Tobacco consumption, including smokeless tobacco (SLT), betel-quid chewing, excessive alcohol consumption, poor oral hygiene, nutrient-deficient diet, and sustained viral infections, i.e., human papillomavirus (HPV), are some of the risks associated with the occurrence of oral cancer. [2,3]

Early detection of oral cancers makes them more amenable to treatment, thus reducing morbidity and allowing the greatest chance of cure.

Knowledge of oral cancer among current and future dentists is crucial for early detection and prevention of cancer.[4] Several studies have found that dental practitioners fail to recognize oral cancer at an early stage due to poor attitudes and a lack of knowledge about the disease's symptoms and signs.[5] Dental students utilizing the space retention technique[6] can be pioneers in detecting oral manifestations of cancer, ultimately leading to earlier diagnosis and potential lifesaving interventions.

The current study is planned to train dental students to identify the early signs of oral cancer and long-term retention of assimilated information through spaced retention.

AIM:

Building up the capacities of Junior dentists of Lenora Institute of Dental Sciences for practicing oral cancer screening through the Space Repetition technique - An Impact evaluation study.

OBJECTIVES:

1. To train dental students for the early detection of pre-cancerous lesions.

2. To employ the space retention technique in dental students for long-term memory.

A cross-sectional survey is planned to be conducted among dental students who are about to graduate with their BDS undergraduate degree in Lenora Institute of Dental Sciences, Rajahmundry, between 2nd December to 10th December,2023.

Ethical & Informed consent:

Before the Commencement of the study, ethical clearance was obtained from the institutional ethical committee, the Lenora Institute of Dental Science, Rajahmundry. (20/IEC/LIDS/UG/2023)

Methodology:

A longitudinal study with an educational intervention was designed for a period of 3 weeks. In this intervention, dental students are trained for early detection of pre-cancerous lesions, and retention of the information is checked by the space retention technique. Before the start of the

study, ethical clearance was obtained from the ethical committee of the college. By using the convenience sampling technique, all the interns of Lenora Institute of Dental Sciences are included in the study. Students who have not given consent are excluded. A pre-structured questionnaire was designed to assess the knowledge of interns to detect pre-cancerous lesions. The questionnaire was validated on 10 students for feasibility and understanding.

The training program was given through a PowerPoint presentation on screening for oral cancer, which was verified by subject experts, and retention of the information is checked by the Space retention technique.[6,7]

As per this technique, knowledge is checked at certain intervals of time, that is, on the first day, the seventh day, and the sixteenth day. On the first day of the program, the questionnaire was distributed to all the interns, and data regarding their basic knowledge was recorded. Followed by power PowerPoint presentation and at the end of the presentation, again a questionnaire was distributed to assess the gained knowledge. The same procedure is repeated on the seventh and sixteenth day of the program.

STATISTICAL ANALYSIS:

The impact of the training program and retention of the knowledge is assessed by conducting statistical analysis using the SPSS software version 26.0, and $p<0.05$ is considered significant.

Chi-square test is employed to analyze the pre- and post-collected data.

This research project included pre-test and post-test assessments, self-administered questionnaires. A PowerPoint presentation was designed about oral cancer screening. For the purpose of providing an informative and concise representation of oral cancer screening, how to identify the pre-cancerous lesions, and how to diagnose using various diagnostic tools like staining the lesions (or) veloscope.

Students were asked to complete the questionnaire before and immediately after watching the educational PowerPoint.

The questionnaire includes multiple-choice questions and five clinical case identification questions that measure participants' short-term recall of information presented in the learning session.

Results:

The present study shows there is a gradual increase in self-assessment of knowledge on oral cancer screening from baseline to the second repetition of the learning session, and the observation is statistically significant, P=0.23

Table 1: **Self-assessment of oral cancer knowledge at baseline and at repetition of of learning sessions.**

Self assessment	Base line	Repetition 1	Repetition 2	Chi-square t value	P value
Excellent	10	19	25	-1.23	0.02
Good	45	35	34		
Fair	4	6	3		
Poor	3	2	0		

Table 2: Knowledge of Junior Dentists on Oral Cancer

knowledge of Junior Dentists	Base line Correct answers (n)	Repetition 1 Correct answers (n)	Repetition 2 Correct answers (n)
1. Which is the most common type of oral cancer?	17	41	55
2. The most common site of Squamous cell carcinoma	18	37	44
3. Squamous cell carcinoma is diagnosed at an advanced stage.	51	57	61
4. Do you know about Diagnostic delay?	23	51	60

Table 2 shows that there is a gradual increase in the knowledge of oral cancer screening from baseline to the second repetition of the learning session, and it was also observed that there is a good retention of information about the same.

It was observed that there is a change in the attitude about oral cancer screening among junior dentists after participating in the learning session, and most of them felt that they gained

sufficient knowledge concerning the prevention and detection of oral cancer. Moreover, almost all the participants are interested in seeking more information on diagnosing oral cancer.

Table3: Attitude of Junior Dentists on oral cancer screening

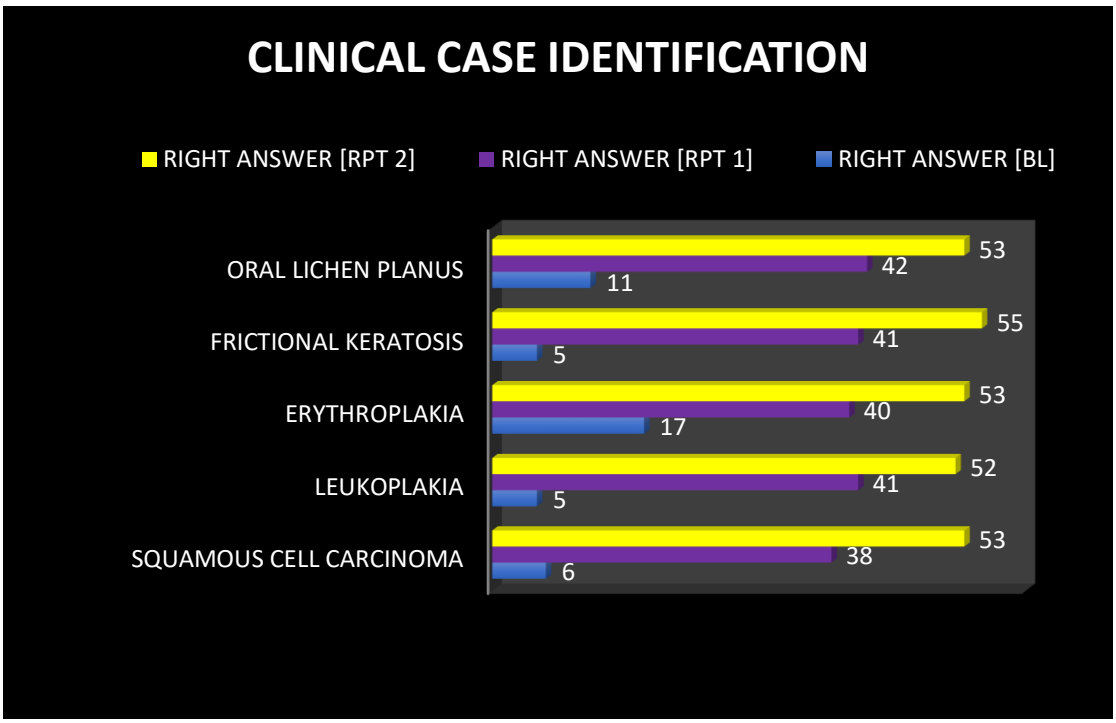
Attitude of Junior Dentists	Base line (n)	Repetition 1 (n)	Repetition 2 (n)
1. When you have graduated, will you advise about the risk factors of Oral Cancer?	54	57	59
2. Do you ask patients if they use tobacco?	36	55	57
3. Do you advise your patients to quit tobacco?	45	45	51
4. Do you think patient should go to physician if he / she had an oral lesion?	52	54	55
5. Do you feel that you have sufficient knowledge concerning prevention and detection of oral cancer?	28	46	55
6. would you like more information or teaching on oral cancer?	59	56	57

There is a remarkable change in the attitudes of junior dentists regarding the practice of oral cancer screening in their routine clinical examinations.

Table:4: **Practices of oral cancer screening among junior dentists**

Practices of Junior dentists	Base line (n)	Repetition 1 (n)	Repetition 2 (n)
1. Do you perform a dental examination to detect oral cancer routinely?	23	37	56
2. Have you had the opportunity to examine patients with a suspicious oral lesion?	47	54	57
3. When you detect suspected malignant lesions, how do you refer the cases?	15	45	58

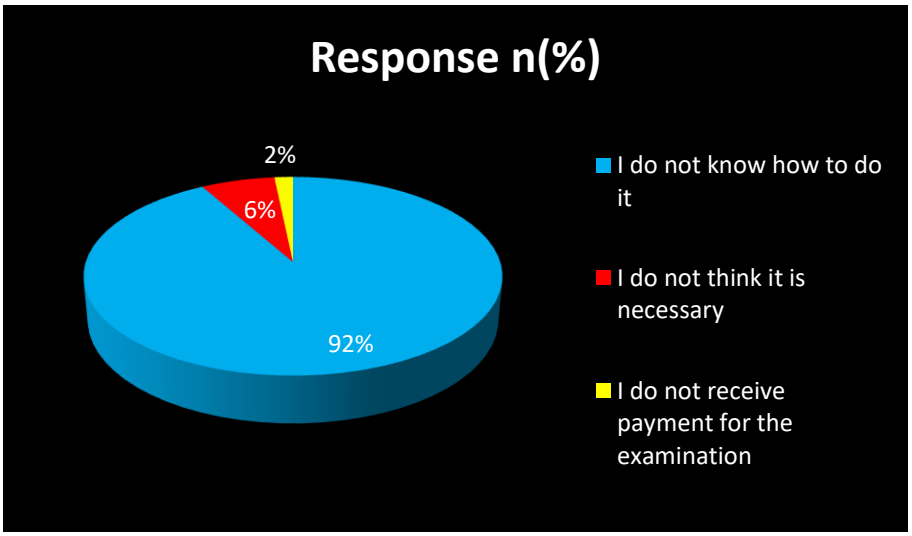
GRAPH 1: CLINICAL CASE IDENTIFICATION BEFORE AND AFTER LEARNING SESSION ON ORAL CANCER SCREENING



Graph 1 shows that there is a comparison of clinical case identification from baseline to repetitions; all the participants have gained good knowledge in identifying the precancerous

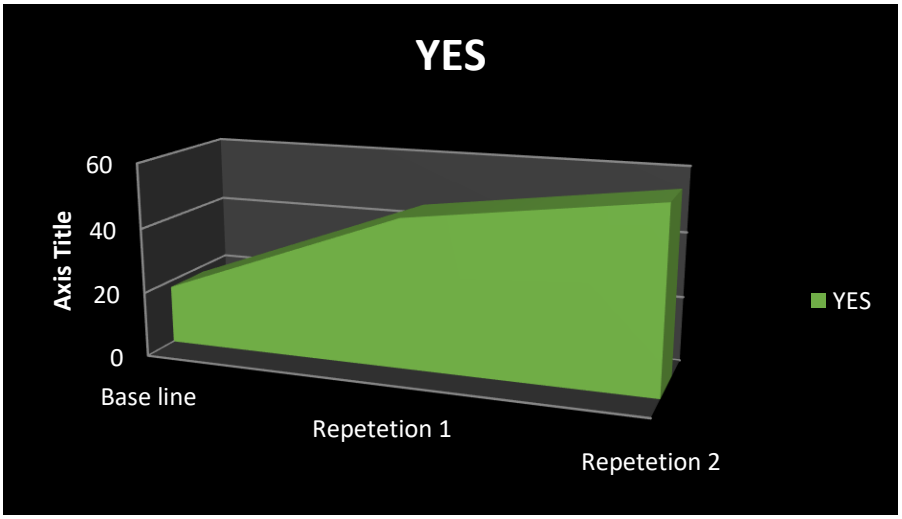
lesions.

Graph: 2. Explanation for not performing oral cancer examination



Graph 2 highlights the reason for not performing oral cancer examination in their routine practice, as the participants feel that they do not know how to perform the dental examination for the detection of oral cancer accurately.

Graph: 3 Do you feel you have sufficient knowledge concerning the prevention and detection of oral cancer?



Graph 3 shows there is an eventual increase in the positive response for the gain of sufficient knowledge on prevention and detection of pre-cancerous and cancerous lesions among junior dentists.

DISCUSSION

A longitudinal study with an educational intervention was designed for a period of 3 weeks. In this intervention, dental students are trained for early detection of pre-cancerous lesions, and retention of the information is checked by the space retention technique. As per this technique, knowledge is checked at certain intervals of time, that is, on the first day, seventh day, and on the sixteenth day. On the first day of the program, the questionnaire was distributed to all the interns, and data regarding their basic knowledge was recorded. Followed by power PowerPoint presentation and at the end of the presentation, again a questionnaire was distributed to assess the gained knowledge. The same procedure is repeated on the seventh and sixteenth day of the program.

The study is based on the perspective of junior dentists on oral cancer screening and diagnosing the early clinical features of oral cancers and pre-cancerous lesions before the patient condition of health goes out of hand.

This study reports the changes in the accuracy of junior dentists in recognizing oral mucosal changes and assessing their potential for malignancy before and after attending a learning session on oral cancer education. Our comprehensive activity comprised lectures and Case-based discussion of prepared cases with images. [15,16.] Further, we utilized a validated tool to ensure the reliability of the findings. We limited the study to dental interns and junior dentists who practiced for less than 5 years and graduated from the same institute to ensure that the participating dentists have similar and recent knowledge concerning oral cancer knowledge and training.

The purposes of this study were to investigate the knowledge, opinions, and clinical practices of practicing dentists related to oral cancer prevention and oral screening in Lenora Institute of Dental Sciences, Rajanagaram, and to recognize the factors that influence their practices of oral cancer screening. The hypothesis stating that practicing dentists in Lenora Institute of Dental Sciences would have satisfactory knowledge and clinical practice related to oral cancer prevention and oral mucosal screening is proven. [17]

Prevention should hence be the first criterion of any intervention program, but early detection through screening and self-examination should also be given utmost importance. This would help in treating the disease at a stage where there is a hope for a better prognosis. Health care providers, media, and various other community sectors should be used to their full potential to get the best out in terms of community service. It is the duty of a health care provider to fill the gap of knowledge by educating their patients about oral cancer if they observe him/her to be more prone to developing the disease, depending on the risk factors involved

CONCLUSION

Based on this study's results, the following conclusions can be made:

The oral cancer screening educational intervention in the form of a PowerPoint presentation tested in this study increased knowledge and learning of junior dentists at Lenora Institute of Dental Sciences, Rajanagaram. Participants reported a great interest in the oral cancer screening and that the information given will change their daily practice for diagnosing the oral cancerous and pre-cancerous lesions. Dental students lack knowledge in oral cancer screening; therefore, there is a need to address gaps in dental curricula and the need to promote education and involvement of dental students in the care of identifying the lesions, which may be a warning sign to cancer development. Moreover, there is a need to find the best tools to deliver information on oral cancer screening to dental students.

REFERENCES

[1]. Sankaranarayanan R, Ramadas K, Thomas G, Muwonge R, Thara S, Mathew B, Rajan B; Trivandrum Oral Cancer Screening Study Group. Effect of screening on oral cancer mortality in Kerala, India: a cluster-randomised controlled trial. Lancet. 2005 Jun 4-10;365(9475):1927-33. .

[2]. Reidy, J., McHugh, E., & Stassen, L. F. (2011). A review of the relationship between alcohol and oral cancer. *The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland*, *9*(5), 278–283.

[3*]. Borse, V., Konwar, A. N., & Buragohain, P. (2020). Oral cancer diagnosis and perspectives in India. Sensors international, 1, 100046.*

[4]. Seoane-Lestón, J., Velo-Noya, J., Warnakulasuriya, S., Varela-Centelles, P., Gonzalez-Mosquera, A., Villa-Vigil, M. A., Rodríguez-Lozano, F., & Diz-Dios, P. (2010). Knowledge of oral cancer and preventive attitudes of Spanish dentists. Primary effects of a pilot educational intervention. *Medicina oral, patologia oral y cirugia bucal*, *15*(3), e422–e426.

[5]. Mariño, R., Haresaku, S., McGrath, R., Bailey, D., Mccullough, M., Musolino, R., Kim, B., Chinnassamy, A., & Morgan, M. (2017). Oral cancer screening practices of oral health professionals in Australia. *BMC oral health*, *17*(1), 151 https://www.edapp.com/blog/how-spaced-repetition-works.

[7]. Voice, Alison & Stirton, Arran. (2020). Spaced Repetition: towards more effective learning in STEM. New Directions in the Teaching of Physical Sciences,15(1)

[8]. Warnakulasuriya S (2009). Global epidemiology of oral and oropharyngeal cancer. Oral Oncol, 45, 309-16.

[9]. Mir Faeq Ali Quadri et al 1918 Asian Pacific Journal of Cancer Prevention, Vol 15, 2014 medical students in 2002. J Cancer Educ, 20, 136-42.

[10]. American Academy of Pediatric Dentistry Reference Manual. Guideline on periodicity of examination, preventive dental services, anticipatory guidance, and oral treatment for children. Pediatr Dent 2005-2006; 27(7 Suppl):84-86.

[11]. Eysenbach, G. Improving the quality of Web surveys: The Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J. Med. Internet. Res. 2004, 6, e34. [CrossRef]

[12]. El-Naggar, A.K.; Chan, J.K.C.; Grandis, J.R.; Takata, T.; Slootweg, P.J. (Eds.) WHO Classification of Head and Neck Tumours, 4th ed.; World Health Organization Classification of Tumors; International Agency for Research on Cancer: Lyon, France, 2017; p. 347. 2.

[13]. Sung, H.; Ferlay, J.; Siegel, R.L.; Laversanne, M.; Soerjomataram, I.; Jemal, A.; Bray, F. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J. Clin. 2021, 71, 209–249. [CrossRef] [PubMed] 3. Bray, F.; Ferlay

[14]. Gaballah K, Faden A, Fakih FJ, et al (2021). Diagnostic accuracy of oral cancer and suspicious malignant mucosal changes among future dentists. Healthcare (Basel), 2021, 9.

[15]. Saleh, A.; Kong, Y.H.; Vengu, N.; Badrudeen, H.; Zain, R.B.; Cheong, S.C. Dentists' perception of the role they play in early detection of oral cancer. Asian Pac. J. Cancer Prev. 2014, 15, 229–237. [CrossRef]

[16]. Ariyawardana, A.; Ekanayake, L. Screening for oral cancer/pre-cancer: Knowledge and opinions of dentists employed in the public sector dental services of Sri Lanka. Asian Pac. J. Cancer Prev. 2008, 9, 615–618.

[17]. Mighell AJ, Freeman C, Atkin PA, et al (2018). Oral Medicine for undergraduate dental students in the United Kingdom and Ireland-A curriculum. Eur J Dent Educ, 22, e661-e8.

[18]. Reed SG, Duffy NG, Walters KC, et al (2005). Oral cancer knowledge and experience: a survey of South Carolina medical students in 2002. J Cancer Educ, 20, 136-42.